The featheries and the furries

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CHAPTER 4

Use of animal species data in environmental impact assessments

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Abstract

Environmental Impact Assessments (EIAs) should ideally help minimize adverse effects on biological diversity by considering impacts of projects on wide ranges of species. This paper investigates how recent Dutch EIAs included the species comprising animal diversity.
We present results of two studies on fauna data used in the EIAs. Objectives were to determine for different taxa (a) the relative representation of species in Environmental Impact Statements (EISs); (b) the extent to which EISs referred to specific species and the accuracy of survey data referred to; and (c) apparent roles of different EIA actors in species inclusion. EIAs were found to use data on various taxa but on limited numbers of species. The frequency with which taxa were included varied significantly. Birds were most frequently included, followed by mammals, amphibians, and other species groups.
The quality of data on birds exceeded that regarding other vertebrates. Our results indicate that (a) EIA working groups of independent experts were the most influential in determining the data to be used; (b) on average, proponents included data more often than required by guidelines; and (c) in 30 to 40% of the EIAs, the participation of nongovernmental organizations prompted use of data. Despite the key role of experts in data inclusion, the taxon rankings found in the EIAs showed little deviation from those observed in studies on peoples preferences for species. Given the limited ranges of species considered, it is doubtful that the EIAs examined effectively contributed to conserving animal species diversity.

Keywords: the Netherlands, Environmental Impact Assessments, biodiversity, species, animals, experts

Article 14 of the UN Convention on Biological Diversity (CBD) calls for contracting parties to 'introduce appropriate procedures requiring environmental impact assessments of its proposed projects that are likely to have significant adverse effects on biological diversity with a view to avoiding or minimizing such effects' (UNCED 1992). If 'biological diversity' is straightforwardly understood as 'species diversity', (e.g., May 1995), one current challenge to Environmental Impact Assessments (EIAs) may thus be to avoid or minimize adverse effects of projects on the variety of living species. In principle, rising to this challenge demands that EIAs have a wide scope of concern regarding the different species groups that are potentially subject to adverse effects. This paper investigates the scope of concern in recent Dutch EIAs regarding different animal species.

Species diversity includes species belonging to various taxonomic groups (taxa), such as insects or fish. Taxa are defined by the morphological, anatomical, and genetic similarities of species. In general, then, species of different taxa exhibit different physical and behavioral characteristics, such as body shape or locomotion. Several of these characteristics are believed to affect human attitudes toward species (see Burghardt & Herzog 1980, 1989;

Kellert 1996). In particular, birds, but mammals too, are among the most preferred animal taxa, as illustrated by peoples judgments of the attractiveness of species (Kellert 1980; Schulz 1987) or attitudes of nongovernmental organization (NGO) policy makers toward the conservation of species (Knegtering *et al*. 2002). At a macro level (i.e., public decisions), similar patterns have been observed. Analysis of Dutch species legislation enacted in the period 1857–1995 revealed that considerably more bird than mammal species had been protected during that period (Knegtering *et al.* 2000). Metrick and Weitzman (1998) showed that certain vertebrate taxa were significantly more likely to be listed under the U.S. Endangered Species Act of 1973. Birds were the most likely vertebrates to be listed, followed by mammals and other vertebrate groups.

However, evidence suggests that the vulnerability to anthropogenic impacts is unlikely to be confined to such 'popular' taxa as birds or mammals. For example, recent analysis of losses of British butterfly, bird, and plant species showed that, on average, butterflies experienced greater losses of previously occupied grid cells than birds did (Thomas *et al.* 2004). This raises the question: how do EIAs take different taxa into account when considering potential impacts of projects?

Taxa in EIAs

An Australian Environmental Impact Statement (EIS) on mining included only birds, mammals, amphibians, and reptiles (Read 1994). An analysis of 37 EISs concerning road schemes in the United Kingdom revealed that bird species were included in 22% of the EISs, invertebrate species in 22%, and mammal species in 13.5% (Treweek *et al.* 1993). More recently, the frequency with which mammals were included in 35 British road schemes EISs referring to new EIA-related ecological surveys ranged from 2.5% (for deer species) to 40% (for badgers *Meles meles*). Invertebrates were included in 20% of the statements, birds in 17.1%, and amphibians in 11.4% (Byron *et al.* 2000).

Thompson *et al.* (1997) reviewed 179 EISs concerning a variety of types of projects in the UK. Unpublished data from this review show that 28% of the statements referred to bird species, 20% referred to terrestrial invertebrates (including butterflies), 15% referred to mammals, and 1% to fish (J. Treweek, personal communication 2001). Data on other animal taxa included in the EISs were not available. A review of EIA experiences in 15 different countries provides further, albeit qualitative, evidence that impact assessments tend to neglect certain taxa (Treweek 2002).

The above-mentioned studies suggest that EIAs use species data of only a limited number of taxa, and that the frequency with which species of various taxa are included in EIAs differs. However, the most comprehensive of these studies are restricted to just a limited number of project types (i.e., mining or road schemes). Consequently, it is unclear how EIAs in general, i.e., concerning various project types, tend to use data of different species. Furthermore, despite the importance of data quality for proper assessment, little analysis has focused on variations in quality among taxa in EIA species data. In addition, little is known of the processes and forces that affect the use of species data in EIAs. Many have advocated a stronger role for science in EIAs, including in data collection (e.g., Morrison-Saunders & Baily 2003). In an attempt to increase public confidence and to reduce bias, some countries, including the Netherlands, have introduced some form of independent advice into the EIA system (Partidário 1993). The input of these independent experts can conceivably affect the use of species data.

This paper presents the results of two independent quantitative studies (Study 1 and Study 2) that share similar and complementary research questions and approaches to studying animal species data used in Dutch EIAs. We have three objectives: (1) to determine the relative representation of species of various taxa in environmental impact statements (the final products of environmental impact assessments); (2) to determine whether the quality of species data included in EISs varies with taxa. In determining 'quality' we focus on the extent to which EISs actually refer to specific species and the accuracy of species survey data referred to in EISs (Study 2); and (3) to assess the apparent roles and preferences of different EIA actors, including those of independent experts, in incorporating data on species of different taxa in EIAs.

Species Data in Dutch EIAs

After its trial introduction in 1981, an EIA system was officially introduced in the Netherlands in 1987. The Dutch EIA system is comprehensive in comparison with the systems of several other countries (e.g., Wathern 1990; UNECE 1991; Sadler 1996; Wood 2002). Table 4.1 presents an outline of the Dutch procedure, based on information published by Van der Geest and Delleman (1996), Ten Heuvelhof and Nauta (1997), and Arts (1998).

Dutch EIA legislation does not require the consideration of species data, although proponents sometimes use such data, on their own initiative, in the notifications of intent. The final EIS guidelines and the EIS documents, however, are the most important stages with regard to the selection of species data to be included. Final guidelines for EISs may explicitly require species data and they usually follow the advice guidelines of the EIA Commission, which is, in practice, a working group comprising independent experts that is specifically set up for a particular EIA. As a result, the EIA Commission (i.e., the working groups), legal advisors, and the public are therefore potentially important actors. Nature-oriented NGOs acting as 'the public' may be particularly important in addressing species issues.

Table 4.1 *The EIA procedure in the Netherlands*

Phase	Actions
Screening	■ The proponent informs the competent authority of the proposed project.
	■ The competent authority determines whether an EIA is required.
	■ If an EIA is required, the proponent submits a notification of intent.
Scoping	■ The competent authority publishes the notification of intent.
	■ Legal advisors and the public advise the competent authority on the content required for the EIS.
	■ The EIA Commission prepares advice guidelines for the EIS.
	■ The competent authority consults the proponent.
	■ The competent authority publishes the final guidelines for the EIS.
Producing the EIS	■ The proponent produces and submits the EIS.
	■ The competent authority determines the acceptability of the EIS.
	■ The competent authority publishes the EIS, if and when accepted.
Review and advice	■ Legal advisors and the public comment on the EIS.
	■ The EIA Commission produces a review advisory on the EIS for the competent authority.
Consent decision	■ The competent authority considers the EIS in its formal consent decision concerning the project.
Evaluation	■ The competent authority provides a program for ex post evaluation of the actual environmental impacts of the project.

To encourage such participation, the Dutch EIA Commission routinely informs these NGOs of every new EIA procedure that could potentially affect species or ecosystems.

The main product of the EIA process is the EIS. Although species data may appear in various sections of an EIS, those sections describing the current environmental condition usually consider these data in the greatest depth. The EIS is often produced by a consultancy engaged by the proponents of a project. In some cases, ministries act as proponents. Ministerial departments, therefore, often produce EISs.

Methods

Study 1

A sample of 55 location-related EISs published in the Netherlands between 1984 and 1995 was obtained as follows: EISs were singled out at intervals of 10 EISs from a list of all Dutch EIAs, numbered consecutively by registration date. If a selected EIS was not present in the library of the Dutch EIA Commission, the available statement with the nearest registration number was selected instead. To achieve a sample representing the distribution of activity categories and regions from the overall EIA list, additional EISs were selected from particular activity categories and regions that were underrepresented in the initial sample. Statements duplicated in Study 2 (four cases) were removed, resulting in a sample of 51 EISs.

Within each EIS, all sections dealing with flora and fauna were scanned for fauna descriptions. Of each main taxon (see S = 1, below), the most specific fauna descriptions still referring to different species or taxonomic subgroups were sought, labeled according to one of three species-specificity levels S (see below), and recorded. Thus, if an EIS mentioned both 'geese' and specific species of geese (e.g., 'white-fronted goose'), only the latter were labeled and recorded. An S value of 1 was assigned to descriptions distinguishing only among main taxa, i.e.: 'birds', 'mammals', 'amphibians', 'reptiles', 'fish', 'insects', 'turbellarians' (i.e., flatworms), 'gastropods', 'bivalves', 'hirudineans' (i.e., leeches), 'oligochaetes' (i.e., annelid worms), 'arachnids' (i.e., spiders, ticks, etc.), or 'crustaceans'. This value was also assigned to reports of a number of species (e.g., '25 bird species') or nontaxonomic subgroups (e.g., 'meadow birds') of these taxa. Fauna descriptions referring to taxonomically higher levels (e.g., 'mollusks') than those of the main taxa distinguished were ignored. An S value of 3 was assigned to descriptions of specific species (e.g., 'white-fronted goose'), and a value of 2 was assigned to all descriptions falling between taxonomic levels 1 and 3 (e.g., 'geese'). The numbers of different fauna descriptions recorded by main taxon were summed by specificity level. The frequency with which taxa were included was calculated as the percentages of EISs mentioning taxa on minimum levels of S. For example, the frequency of a given taxon for S ≥ 1 included all EISs with descriptions of the taxon on the levels S = 1 or S = 2 or S = 3.

Study 2

Study 2 was part of a larger study on quality and availability of fauna data for EISs (Ministerie van VROM & Ministerie van LNV 1997). Twenty-three location-related EIAs and one land development EIA published in the Netherlands between 1994 and 1996 were deliberately selected to achieve a sample that (a) concerned projects potentially affecting wild animals; (b) covered various EIA activity categories; and (c) covered the chosen time period evenly. Location-related EIAs concerning the establishment of projects in already existing industrial zones or concerning extensions of already existing installations were excluded.

All of the selected EIAs, including the advice guidelines and final guidelines, were scanned for fauna data. In addition, an inventory was made of the comments of legal advisors and of the public advocating the incorporation of fauna data in EIS guidelines.

The effectiveness of the comments of legal advisors and the public in realizing the incorporation of fauna data in the guidelines for EISs or in the EISs was estimated by taxon as the number of cases in which a taxon occurred in either the EIS or its preceding guidelines as a percentage of the number of comments advocating the incorporation of fauna data on that taxon. To this end, all fauna data in the EIS sections describing the current environmental condition were recorded. We distinguish between *potential* effectiveness - determined by considering all cases in which a taxon was included - and the *evident* effectiveness of recommendations by considering only cases in which taxa were included with explicit reference to the recommendations. Fauna data were recorded for the following taxa: birds, bats, 'other mammals', amphibians, reptiles, fish, butterflies, and 'other insects'.

To assess the quality of EIA fauna data, EIS sections describing the current environmental condition of planned locations were scanned more strictly. Fauna data referred to in these sections and lacking source references were ignored. As a result, three EISs were left out completely, because these EISs contained no source references at all. The age, spatial scale, and comprehensiveness of data sets were recorded independently and assigned to one of two levels for each variable. Levels for the age of data were *less recent* (older than 5 years) and *more recent* (up to and including 5 years of age). According to spatial scale, data were recorded as either *less detailed* (grid cells represented 25 km^2 or more) or *more detailed* (grid cells represented 1 km^2 or data specifically concerned the project area). The comprehensiveness of data was recorded as either *less comprehensive* (incidental species records or species lists in which the extent of coverage was unclear), or *more comprehensive* (all-inclusive species lists, with or without extra attention to species having special conservation status, e.g., red list species or species living in colonies). Data sources were inspected where necessary. Data age was defined as the period between the survey and publication of the EIS. For long-range surveys, such as are published in species distribution atlases, the median values of the survey years concerned were used to define data age. For each variable, variation among the two quality levels defined was analyzed for birds versus the other vertebrate main taxa combined on the basis of the absolute numbers of observed cases (i.e., numbers of EISs referring to data of a given taxon for a given quality level), using a chi-square test. Our null hypothesis was to see no difference between birds and other vertebrates in the variation among quality levels. We compared birds with other vertebrates, because studies on indiviuals attitudes towards species and on species legislation (see above) revealed particularly high rankings for birds, and to obtain sufficient cells with a minimum expected frequency of five cases.

Combined EIS samples of Studies 1 and 2

To determine the overall frequency with which taxa were included, subsamples from Study 1 and Study 2 were combined (n = 72 EISs). The subsample from Study 1 included all fauna descriptions having a species specificity of at least level 2 (n = 51 EISs). The subsample from Study 2 was the same sample that had been used to determine quality of data (n = 21 EISs; see above). Using equal representation of taxa in EISs as a null hypothesis, variation among taxon frequencies in EISs was analyzed on the basis of the absolute numbers of observed cases (i.e., numbers of EISs referring to a given taxon), using a chi-square test.

Results

Overall taxon frequencies in Environmental Impact Statements

Figure 4.1 shows the overall frequencies of fauna descriptions in EISs for various taxa, expressed as the percentage EISs (from the combined sample of Studies 1 and 2) referring to the taxa. With an alpha level of .05, the variation among the frequencies of the main taxa distinguished was significant ($\chi^2(5, N = 182) = 48.90, p < .0001$). The most frequently included taxon was birds, referred to in 81% of the EISs, followed by mammals (54%) and amphibians (49%), insects (32%), and reptiles (19%) and fish (18%). Of the subtaxa distinguished, “other mammals” were referred to in 51% of the EISs, and bats as well as butterflies in 24% of the EISs.

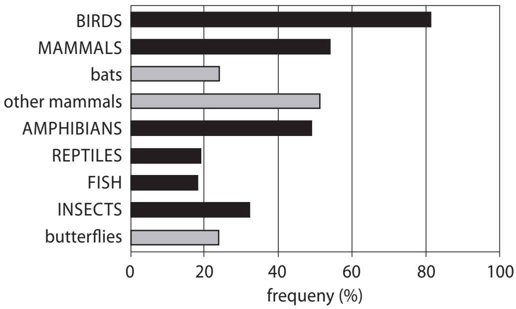

Figure 4.1 *Frequencies with which EISs refer to animals of particular taxa on a reasonable level of species-specificity, or with reference to reasonably accurate species survey data (n = 72 EISs). Solid black bars indicate main taxonomic groups distinguished; dotted bars indicate taxonomic subgroups distinguished. Although frequencies of taxonomic subgroups (e.g., “bats” and “other mammals”) are presented separately, the species of these groups are also included in the frequencies of the corresponding main groups presented (e.g., “mammals”).*

Species specificity of data in EISs

Table 4.2 provides information about the speciesspecificity of fauna descriptions used in the EISs examined in Study 1. The table reports taxon frequencies for different levels of species-specificity, including frequencies of taxa not considered in the combined results presented in Figure 4.1. Of the main taxa distinguished, references to specific species ($S \geq 3$) of birds were most frequent (71% of the EISs), followed in declining order by mammals, amphibians, fish, ‘other invertebrates’ than insects, and reptiles and insects. For most taxa, frequencies show consistent decrease as the level of specificity increases, suggesting that some EISs mentioned animals only at higher taxonomical levels (e.g., ‘birds’ or ‘geese’) instead of mentioning specific species (e.g., ‘white-fronted goose’). Insects (including the subcategories butterflies and ‘other insects’) and reptiles were particularly mentioned only at higher taxonomic levels. For example, although almost 40% of the EISs somehow referred to ‘insects’, only 10% mentioned specific insect species.

Table 4.2 also reports the average number of different species specifically mentioned in EISs (i.e., names with a species-specificity value of 3 or higher). Of the main taxa distinguished, this number was highest for birds: 27 species, and insects: 22 species. For the other main taxa, the average numbers of specific species referred to in EISs were smaller, ranging from approximately 2 species (for reptiles) to 10 species (for 'other invertebrates'). Of the subtaxa distinguished, the mean number of insect species (other than butterflies) was the highest (58 species), although this result is an artifact of one particular EIS.

For the taxa of which specific species had been mentioned in the EISs, the approximate totals of species recorded in the Netherlands are also shown in Table 4.2. According to data of Koomen *et al.* (1995), approximately 88% of all animal species recorded in the Netherlands belong to these taxa. If the ratios in Table 4.2 of mean numbers of species mentioned in EISs (p) to the approximate totals of species recorded for the taxa (q), however, are plotted against these totals (q), the ratios decrease considerably as increasing numbers of species are considered (Figure 4.2). Species in smaller species groups (e.g., reptiles) were therefore relatively considerably more often represented in the EISs, on average, than were the species in larger species groups (e.g., insects). Moreover, of many invertebrate taxa, no species at all were represented in the EISs considered in this study. These taxa, of course, also contribute to animal species diversity.

Table 4.2 *Species-specificity[a] of fauna descriptions in EISs for different taxa (*n *= 51 EISs)*

	S ≥1	**S≥ 2**	**S ≥ 3**					
				Number of species mentioned			**Comparison with total species number in the Netherlands**	
Taxonomic group	Frequency[b] (%)	Frequency[b] (%)	Frequency[b] (%)	Mean (p)	*SD*	Max.	Number of species recorded[c] (q)	ratio p/q
Birds	88.2	72.5	70.6	26.8	24.8	126	338	0.079
Mammals	52.9	49.0	43.1	8.0	6.9	25	83	0.096
Bats	—	15.7	11.8	3.7	1.5	6	20	0.185
Other mammals	—	45.1	41.2	7.3	5.9	23	63	0.116
Amphibians	45.1	33.3	33.3	3.8	2.0	9	16	0.238
Reptiles	23.5	9.8	9.8	2.4	1.2	4	7	0.343
Fish	29.4	19.6	19.6	7.9	9.0	31	155	0.051
Insects	39.2	35.3	9.8	22.2	20.0	58	17,386	0.001
Butterflies	—	23.5	7.8	13.3	9.9	29	2,279	0.006
Other insects	—	18.0	2.0	58.0	0	58	15,108	0.004
Other Invertebrates[d]	25.5	21.6	15.7	9.5	8.6	28	3,781	0.003

[a]*Species-specificity levels: S ≥ 1indicates that at a minimum, the taxonomic main group (e.g., "birds") was mentioned; S ≥ 3 indicates that specific species of the group (e.g., "white-fronted goose") were mentioned; S ≥ 2 indicates that species were mentioned with a specificity level between 1 and 3 (e.g., "geese").*
[b]*Frequency: percentage of the total number of EISs in Study 1 in which a species was included.*
[c]*The mean value of the number of indigenous species and the total number of species (including exotic species) recorded in the Netherlands (Source data: Koomen* et al. *(1995)).*
[d]*The other invertebrate main groups distinguished (for which S = 1) include: turbellarians (i.e., flatworms), gastropods, bivalves, hirudineans (i.e., leeches), oligochaetes (i.e., annelid worms), arachnids (i.e., spiders, ticks, etc.) and crustaceans.*

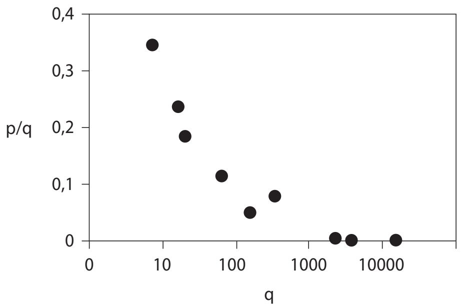

Figure 4.2 *Ratios of the mean number of species mentioned in Dutch EISs (p) to the approximate number of species recorded in the Netherlands (q) as a function of the latter (q) for various taxonomic groups (Table 4.2); the x-axis has been divided logarithmically.*

Age, spatial scale, and comprehensiveness of data in EISs

In the EIAs considered in Study 2, most data used on birds, amphibians, reptiles, fish, and butterflies were 'more recent' rather than 'less recent', although older data had been used in many cases (Table 4.3). Older data often originated from less current literature, including species distribution atlases. It was only for fish that data of less than 1 year old had been used, and we observed that all fish data had originated from surveys conducted specifically for EIAs. This is not surprising, given that, in the periods the EISs examined were produced, no fish distribution atlases had been available in the Netherlands.

Furthermore, most data on birds, amphibians, reptiles, fish, and butterflies tended to be more rather than less geographically detailed (Table 4.3). In most cases, we observed that the data were provided at the scale level of the EIA projects.

Finally, most data for birds, mammals, and butterflies were more rather than less comprehensive, suggesting that the EIAs had intentionally provided better coverage of the species of these taxa. The data for amphibians and reptiles, however, tended to be less rather than more comprehensive. Despite the fact that all fish data originated from surveys conducted specifically for EIAs, lists of fish species tended to be less comprehensive as well.

Compared to other taxa, for birds, data of higher quality, i.e., more recent, more detailed, or more comprehensive data had been particularly more frequently used in EISs than data of lower quality (Table 4.3). Comparing the observed cases for birds to those of all other vertebrate main taxa combined, and with an alpha level of .05, this data quality difference was statistically significant for spatial scale ($\chi^2(1, N = 74) = 3.94, p < .05$) and for comprehensiveness ($\chi^2(1, N = 74) = 7.63, p < .01$), but not for age ($\chi^2(1, N = 74) = 2.91$, *ns*).

Table 4.3 *Age, scale, and comprehensiveness of EIS fauna data by taxon (n = 21 EISs)*

	Taxon frequencies[a] by age of data[b]		**Taxon frequencies[a] by spatial scale of data[c]**		**Taxon frequencies[a] by comprehensiveness of data[d]**	
Taxonomic group	Less recent (%)	More recent (%)	Less detailed (%)	More detailed (%)	Less comprehensive (%)	More comprehensive (%)
Birds	20.8	66.7	20.8	66.7	12.5	75
Mammals	50	45.8	58.3	37.5	33.3	62.5
Bats	16.7	20.8	20.8	16.7	12.5	25
Other mammals	33.3	25	37.5	20.8	20.8	37.5
Amphibians	33.3	41.7	33.3	41.7	45.8	29.2
Reptiles	16.7	20.8	16.7	20.8	20.8	16.7
Fish	0	12.5	0	12.5	8.3	4.2
Insects	—	—	—	—	—	—
Butterflies	4.2	16.7	4.2	16.7	8.3	12.5

[a]*Taxon frequency: percentage of the total number of EISs; per taxonomic group, the sum of the percentages for both levels of each quality variable equals the taxon frequencies in EISs presented in Table 4 (right column).*
[b]*Age of data: less recent = older than five years; more recent = less than or equal to 5 years.*
[c]*Spatial scale of data: less detailed = grid cell size of 25 km² or more; more detailed = grid cell size of 1 km² or data at project level.*
[d]*Comprehensiveness of data:* less comprehensive = *incidental species record or comprehensiveness of species list unclear;* more comprehensive = *comprehensive species list or comprehensive species list with extra attention to species with a special conservation status.*

Taxon frequencies in various stages of Environmental Impact Assessment

Of the EIAs examined in Study 2, Table 4.4 presents, besides taxon frequencies appearing in EISs, the taxon frequencies occurring in the preceding guidelines. Variations in taxon frequency in the EISs reflect the differences in the EIS guidelines. Despite the more conservative estimation of taxon frequency within the EISs themselves, these frequencies tended to exceed those observed in the guidelines. This was particularly apparent for amphibians, where the taxon frequency from EISs was 75%, as compared to 29% from the guidelines.

In two thirds of the EISs considered in Study 2, comments advocating the incorporation of specific fauna data had been made by legal advisors and by the public during the advice guidelines stage. A total of 45 such recommendations concerned specific taxa: 4 by legal advisors, 24 by nature-oriented NGOs concerned with species surveys, 15 by other nature-oriented NGOs, and 2 by an advisory body. Table 4.5 presents the numbers of the recommendations by taxon. For main taxa, the most recommendations concerned mammals (47%) and birds (27%), followed by the other taxa.

The estimated effectiveness of the recommendations described above is also presented in Table 4.5. In approximately 50 to 70% of the cases, the recommendations resulted in the incorporation of particular fauna data into both the guidelines and the EISs. Although nature-oriented NGOs provided 87% of the comments, they contributed to only 30 to 40% of the EIAs. For several taxa, the recommendations appeared less effective with regard to inclusion in EISs than to inclusion in the guidelines. Furthermore, although effectiveness of recommendations varied among taxa (Table 4.5), the pattern was not similar to that observed in the guidelines or in the EISs (Table 4.4). For the main taxa included in the guidelines, the estimated effectiveness of the recommendations was (potentially) higher for amphibians, reptiles, mammals, and birds, ranging from 33 to 100%, and lower for insects and fish, ranging from 25 to 33% (Table 4.5). For the main taxa in the EISs, the estimated effectiveness was (potentially) higher for fish, birds, and mammals, ranging from 50 to 100%, and lower for insects, amphibians, and reptiles, ranging from 0 to 17%.

Table 4.4 *Taxon frequencies[a] for fauna data in guidelines and EISs*

	In guidelines (*n* = 24 EIAs)	**In EIS s[b] (*n* = 21 EIAs)**
Taxonomic group	(%)	(%)
Birds	66.7	87.5
Mammals		58.3
Bats	20.8	37.5
Other mammals	37.5	58.3
Amphibians	29.2	75.0
Reptiles	25.0	37.5
Fish	2.5	12.5
Insects	—	—
Butterflies	12.5	20.8
Other insects	4.2	0

[a]Taxon frequency: number of guidelines or EISs in which taxa were included, expressed as a percentage of the total number of EIAs or EISs.
[b]Only the EIS sections describing the current environmental condition were scanned, and only data accompanied by source references are included.

Table 4.5 *Recommendations[a] to incorporate specific fauna data in EISs for different taxa (*n *= 24 EIAs)*

Taxonomic group	**Number of recommendations**	**Effectiveness[b]** For EIS guidelines (%)	**Effectiveness[b]** For EISs (%)
Birds	12	33–83	50–100
Mammals	21	67–81	57–71
Bats	8	63	50
Badgers *Meles meles*	4	100	100
Other mammals	9	56–89	44–78
Amphibians	1	100	0
Reptiles	1	100	0
Fish	4	25	75–100
Insects	6	33	17
Butterflies	3	67	33
Other insects	3	0	0
Overall	45	51–71	49–73

[a]Recommendations of legal advisors and the public.
[b]Effectiveness: number of cases in which a species group was included as a percentage of the number of recommendations. Ranges: the lowest value represents the evident effectiveness, i.e., the cases in which the species group was included with explicit reference to the recommendations; the highest value represents the potential effectiveness, i.e., all the cases in which the species group was included. If no ranges are given, the evident and potential effectiveness are equal.

Discussion

Our results revealed that Dutch EIAs reflected a limited number of the species comprising animal species diversity in the Netherlands (Study 1). Moreover, the frequencies with which species were included in the EISs varied considerably across taxa (Study 1 and Study 2). Birds ranked highest on taxon frequency, followed by mammals, amphibians, insects, and reptiles and fish. In addition, data on birds were more often of higher quality than data on other vertebrates (Study 2).

The taxon rankings emerging from the EISs considered in this study closely resemble those found in studies on Dutch species law (Knegtering *et al.* 2000), attitudes of Dutch NGO policy-makers toward particular species (Knegtering *et al.* 2002), and individual preferences for species in the USA (Kellert 1980) and Germany (Schulz 1987). Partial data from another EIS study concerning a variety of projects (Thompson *et al.* 1997) also suggest that birds were the most frequently included taxon in a sample of British EISs (J. Treweek, personal communication 2001). Thus, despite the inherent 'rational' nature of EIA systems and the important role of independent experts in the Dutch system, the taxon patterns in this study showed little deviation from taxon patterns observed in studies of other types of human–species relationships. Although we observed in several cases that EISs motivated the inclusion in EISs of individual species, there is no evidence that the taxa to which these species belong had been deliberately 'singled out' for inclusion. The taxon patterns in EIAs are thus unlikely to result from assumptions in EIAs that, for instance, birds are more likely to be vulnerable to project impacts than would other taxa. Therefore, other factors are more likely to explain the pattern. Such factors may include uneven availability of species data for different taxa, variation in the capacity of nature NGOs concerned with particular taxa to participate in EIAs, and species preferences of various actors involved in EIAs.

Our results also revealed that certain taxa had, on average, been more frequently included during the EIS stage of the species incorporation process than in the preceding guidelines stage (Table 4.4). (The pattern was reversed for several taxa, however, with regard to recommendations to incorporate fauna data (Table 4.5)). This suggests that project proponents (who themselves produce EISs) were particularly likely to use more fauna data for various taxa than required by the preceding guidelines for these statements. In addition, we found that the recommendations of nature-oriented NGOs resulted in the incorporation of fauna data into approximately 30 to 40% of the EIAs considered in this study. Although this suggests that such organizations have considerable influence in the EIA process, neither NGOs nor other actors contributed to the species content of the majority of the EISs and guidelines. Competent authorities usually follow the advice guidelines of the EIA Commission, i.e., the working groups comprising independent experts. Consequently, these working groups of experts apparently had the most influence on the fauna content of EIAs.

Individual-level factors such as species preferences may have influenced the selection of taxa to be incorporated in EIAs, and may have resulted in a pattern of taxon representation as shown in Figure 4.1. However, this pattern was not generally present in all our results. For example, the ratio of the mean number of species for the taxa reported in EIS to the approximate totals of species recorded in the Netherlands (the *p/q* ratio) was highest for reptiles and amphibians, but not for birds (Table 4.2). This pattern could possibly be explained by the fact that, in larger species groups (e.g., birds), more species are relatively rare. Rare species are less likely to be found near project areas, and are thus less likely to be included in corresponding EIAs.

Bird data were obviously more often of higher quality than were data on other vertebrate taxa. This seems to parallel a relatively high attention for birds that is also reflected in the high frequency of birds in EISs (Figure 4.1). However, inspection of our data suggests that for most other taxa, data quality was more variable. Moreover, the data for such less frequently incorporated taxa as fish were more often of higher quality than data for other taxa. In this case, the fact that little data on fish were available probably prompted special surveys. These surveys, in turn, had the result that the most frequently used fish data were more recent and more detailed than were data for other taxa.

The results of this study suggest that species of individual taxa, which together comprise animal species diversity, generally had unequal chances for adequate evaluation in Dutch EIAs. We found no indication in the EISs examined in this study that, in general, the species included in the assessments were representative of actual species diversity or had been deliberately selected to be so. Moreover, a focus on, for example, the bird species in an area does not imply that most species of other taxa are automatically taken into account also, because species-rich areas may frequently not coincide for different taxa (Prendergast *et al.* 1993). Given the limited ranges of species considered, we believe that it is doubtful that, in general, the EIAs had been effective as tools for the conservation of species diversity and did substantially contribute to objectives of the Convention on Biological diversity regarding EIAs.

There is a general trend for public conservation tools to focus on the species of relatively few taxa (De Klemm & Shine 1993; Metrick & Weitzman 1998; Knegtering *et al.* 2000; Redak 2000). The taxa that are most likely to be included, however, are not necessarily representative of those that, in reality, appear to be most threatened. For example, in the United Kingdom, decline in an invertebrate species group, such as butterflies, was found to be more severe than decline in birds (Thomas *et al.* 2004), and decline of animal species in the Netherlands was found to be most severe among insects and fish (Koomen *et al.* 1995). Thus, even if EISs should only focus on threatened species, it is advisable to expand the taxonomic range of the species evaluated.

If the challenge of the CBD is to be taken seriously, a logical starting point would be to change the questions asked in EIAs (e.g., Slootweg & Kolhoff 2003). Our results suggest that the EIA Commission, i.e., the working groups of independent experts, plays a prominent role in the selection of species to be considered in Dutch EIAs. Such EIA commissions may be appropriate target groups for policymakers wishing, at the very least, to enhance awareness of the limited scope of current EIAs regarding species diversity. More generally, governments may wish to facilitate the creation of accessible national data banks containing species distribution data for a wider range of taxa. They also may wish to strengthen the role of NGOs concerned with less 'popular' taxa, where appropriate, by supporting them in activities that are relevant for EIAs, such as conducting species surveys or participation in EIAs. Finally, research should also take up the challenge of providing more tools for enhancing the effective and efficient evaluation of possible project impacts on species diversity in general, rather than focusing on the most preferred species.

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